Reducing Food Processing Plants' Energy Costs

High efficient washdown motors make a dramatic impact

Cheryl Higgins, Leeson Electric

U.S. manufacturers, such as food processors, face an unprecedented competitive environment and must look for ways to be profitable without negatively affecting the quality of finished products. The challenge of maintaining high product quality while simultaneously reducing production costs can often be met through investments in energy efficiency, which may include the purchase of energy-efficient technologies like high-efficiency motor systems.

According to the Department of Energy (DOE), electric motor-driven systems are estimated to consume more than half of all electricity in the U.S. and more than 70 percent of all electricity in food and beverage manufacturing applications. These processing plants are large users of energy for refrigeration, cooking, heating, boilers and steam generation, sterilizing, conveyors, and auxiliary equipment. However, because energy is typically viewed as peripheral to the business of production, efficiency projects have an uphill fight for capital and attention. Even if organizations adopt a more holistic approach to energy, managers and engineers often don't have the time to analyze payback from various projects and prioritize them. But this should be one of the first places to look for reducing costs, and improving productivity and profits.

Food Processing Industry and Energy Consumption

The typical industrial plant in the U.S. can reduce its electricity use by around five to 15 percent by improving the efficiency of its motor-driven systems. Process manufacturing has the highest absolute consumption of electricity, 419,587 gigawatt hours per year, and motor systems account for fully 71 percent of this total. A significant challenge in promoting high-efficiency motors is that motor buyers often misunderstand where the costs of motor ownership lie, and therefore do not account for these costs accurately. The greatest cost of motor ownership is that of operating the motor, which represents 97-98 percent of lifetime costs. Initial purchase price represents only an estimated two–three percent.

Energy Efficient Systems

Electric motors used in production facilities with conveyors are almost always on, driving the energy bill higher. But what if there was a way to reduce energy consumption and costs while increasing the efficiency level? There is; through the use of high-efficient motors. Energy efficient motors make economic sense: In an industrial application operating 4,000 hours/year, energy-efficient motors earn back their initial cost in two years.

Upgrade Incentives

Many state organizations and energy companies have created monetary rebate programs available to qualifying businesses. For example, the Wisconsin Food Processing Plant and Food Warehouse Investment Credit is a refundable tax credit for businesses that have invested to modernize or expand food processing plants or food warehouses in Wisconsin and who have been certified by the Wisconsin Department of Commerce.

Tax credits are earned by incurring eligible expenses for modernization or expansion of a food processing plant or food warehouse. This includes constructing, improving or acquiring buildings or facilities, or acquiring equipment for food processing or food warehousing.

Wisconsin also has the Meat Processing Facility Investment Credit program to support the modernization of the state's meat processing industry. The tax credits build on the success of the state's dairy modernization and investment tax programs. The program provides a tax credit for up to 10 percent of the expenditures meat processors invest in modernization or expansion. Eligible costs include construction, additions, utility upgrades, equipment, technology and other upgrades.

In southern Indiana, Dubois REC and other local rural electric cooperatives, in a partnership with Hoosier Energy, have created a monetary rebate program for energy efficient upgrades. Local electric cooperatives have been offering rebates on energy efficiency upgrades through Hoosier Energy since 2009. For a comprehensive listing for your state's incentives, please visit: *http://businessfacilities.com/2015/04/food-processing-facts/*

Food Processing Plant Sanitation

According to a 2011 U.S. Centers for Disease Control and Prevention estimate, 48 million Americans get sick, 128,000 are hospitalized, and 3,000 die annually from food borne illnesses. The costs associated with contaminated food are staggering.

Food processing equipment poses some unique challenges for maintenance personnel. Wet operating conditions and wash-down requirements can require specially-designed equipment. This has become critical since the passage of the Food Safety Modernization Act in 2011. However, one way food processing companies can reduce food borne illnesses and costs is to use stainless steel food safety motors.

These motors don't have crevices where bacterial build-up can start. They are steam and/or waterproof for cleaning-in-place and other demanding wash-down regimes. This is particularly important because when plant personnel take a pressure hose and clean the machine, they don't care if it's a motor, a cable or a drive, they just want it clean according to industry standards. There is no way of efficiently washing a machine.

Specially engineered stainless steel motors also don't have a need for paint that could flake into the food, hold in moisture and hide corrosion. They are of "Totally Enclosed, Not Ventilated" (TENV) design, which means that they do not have a fan and fan cover, which are both difficult to clean and could be the breeding space for bacteria. When selecting a motor upgrade in this industry, it's important to check that the motor is USDA and FDA approved, BISSC Certified, or a motor with IP55 enclosure protection.

Smithfield Foods Reduces Downtime and Expenses

From small town beginnings in Smithfield, Virginia, Smithfield Foods has grown into a $14 billion global food company with a presence in 12 countries and is the world's largest pork processor and hog producer. The Virginia-based pork company derived its ham from a curing process Native Americans taught settlers five centuries ago. Based in the farming heartland of the United States, Smithfield Foods International delivers consistent quality pork across six continents. The company's global commitment is the same one held in the U.S. since 1959-to bring the goodness of America's farmland and second-to-none quality to every plate, every time.

All facilities are certified by a third party to the ISO 14001 Environmental Management System Standard. Farmland Foods was the first meat processing company to have all meat processing and livestock facilities certified to this particular standard.

Millions of dollars are invested each year in capital improvements to facilities and equipment to increase product safety and protect employees while enhancing production. Since 2011, Smithfield Foods has spent more than $5.6 million on projects dedicated to food safety and quality issues, including upgrading motors in processing plants.

Maintaining Sanitation

Food processing plants are a very difficult environment for motors due to the daily cleaning and sanitizing of equipment. Harsh chemicals like sodium hydroxide and other caustics are used to clean equipment and can be extremely corrosive. Not only are caustic chemicals used, high pressure spray is used, sometimes up to 1000 psi with the nozzle held a few inches away from the motor. This ensures all contaminants are removed from the equipment.

Plant downtime emergencies divert limited maintenance personnel and disrupt production at the cost of thousands of dollars per hour. A major consideration in maintenance is food safety. It's very important to get the meat processed quickly and correctly the first time to get it to the consumers. To help reduce downtime because of burned out motors, food processing facilities, such as Smithfield Foods' Denison, Iowa and Sioux Falls, S.D., plants are installing stainless steel washdown motors.

In compliance to the Food and Drug Administration (FDA), these motors are made entirely of stainless steel, including the bases, conduit box covers, fan covers, and bands. The food-grade model consists of materials and lubrication that are food-safe.

This type of motor is suitable for use in the food industry, or in any other applications where motors are commonly exposed to moisture, humidity and specific chemicals that cause corrosion. With the help of washdown motors, flexibility and durability are enhanced, which can yield to minimal operating expenses while increasing uptime.

Previous to installing washdown motors, equipment at these plants used standard motors, which couldn't hold up to the severe chemicals and high-pressure hose washdowns. These motors were being changed out every three to four weeks — amounting to approximately 800 motors at each of these two facilities annually.

"We're always striving to eliminate downtime during production, and cut back on maintenance time and expense," said Diann Loosmore, purchasing information analyst Smithfield Strategic Sourcing & Services Co. Inc. "Replac-

ing all painted, standard motors with stainless encapsulated motors allows for far greater reliability, particularly in these extreme conditions."

Key factors in the motor selection included application specificity, longevity and maintenance.

"These new motors are easy to install, easy to maintain, and they last," added Loosmore. "In fact, in certain applications at the Sioux Falls plant some of the motors have been in service for over a year." The company is so pleased with the motors' performance and reliability that they are installing them in all of their U.S. facilities.

Sources for this article include the following: *www.iac.rutgers.iau*, *www.cggc.duke.edu*, Ibid and *http://web.applied.com/base.cfm?page_id=4176*. **PTE**

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Motor Design Offers Proprietary Shaft Seal

The new Extreme Duck ULTRA motor is engineered with distinct features making it a suitable motor for use in the food processing, pharmaceutical, packaging and beverage industries. The new design ensures that liquids don't penetrate the motors in any mounting position and the motor is easier to install and connect because of unique colored leads.

A proprietary shaft seal that underwent a year of testing — 8,760 hours — is one of the motor's unique features. Other features include lead wires that are *non-wicking*, and colored and numbered for easy identification during installation. Additionally, the motor is installable in all mounting positions, has standard dual voltage and dual rotation, an all stainless steel exterior and a corrosion resistant coating is applied to the rotor. Further exclusive features of the include a new encapsulation process with better materials that ensure complete filling of the motors and curing of the epoxy encapsulation, the nameplate information is permanently etched into the frame, the conduit box on TEFC motors rotates 360 degrees, and an Inverter Duty IRIS insulation system.

Each motor is 100 percent pressure tested before leaving the plant to ensure it is completely sealed to prevent the ingress of liquids. The motor meets the Energy Independence Security Act mandate going into effect June 1, 2016.

The benefits of the Next Generation Extreme Duck Motor include numbered lead wires that enable easier readability and identification, reducing installation time and costs. The extensive pressure testing guarantees liquids don't penetrate the motor, which increases motor life and virtually eliminates plant down time. The elimination of corrosion ensures a longer motor life and lessens operating costs. Additionally, washdown motors enhance flexibility and durability, yielding to minimal operating expenses while increasing plant uptime.

This motor is designed for use in food processing and other applications where motors are exposed to frequent washdown, common cleaning and sanitizing chemicals, and high humidity. Washdown motors provide durability and flexibility to help maximize uptime and reduce overall operating costs in these and many other demanding applications where general purpose motors will not survive. "By listening to customers' feedback we designed this next generation motor with distinct features making it an ideal motor for use in the food processing, pharmaceutical, packaging and beverage industries," said Steve Bernhardt, Leeson Electric lead application engineer. **PTE**